

REDESCRIPTION OF *GONATOCERUS ATRICLAVUS* GIRAULT (HYMENOPTERA: MYMARIDAE), WITH NOTES ON OTHER EGG PARASITOIDS OF SHARPSHOOTERS (HOMOPTERA: CICADELLIDAE: PROCONIINI) IN NORTHEASTERN MEXICO

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Abstract.—The mymarid wasp *Gonatocerus atriclavus* Girault, NEW STATUS, described originally from Trinidad as a variety of *G. triguttatus* Girault, is redescribed and illustrated based on specimens reared from an egg mass of the sharpshooter *Oncometopia clarior* (Walker), collected in Ciudad Victoria, Tamaulipas, Mexico. This is the first known host record for this parasitoid species. Proconiine leafhopper host associations are also reported for three other economically important *Gonatocerus* species from the *ater* species group in North America: *G. ashmeadi* Girault, *G. morrilli* (Howard), and *G. triguttatus* Girault.

Key Words.—Insecta, Cicadellidae, Proconiini, Mymaridae, *Gonatocerus*, egg parasitoid, Mexico.

The glassy-winged sharpshooter, *Homalodisca coagulata* (Say), is native to the southeastern United States and northeastern Mexico. This species recently invaded California and has become established in the southern part of the State. In 2000, several sharpshooter populations were detected north of Kern County. In order to control populations of this xylem-feeding species, an integrated program employing several control options is needed. One cornerstone of an integrated pest management program will be classical biological control.

Egg parasitoids of *H. coagulata* were discovered through survey activities conducted in California and the southeastern United States in 1996 and 1997 (Triapitsyn et al. 1998). Levels of parasitism from one dominant species, *Gonatocerus ashmeadi* Girault (Hymenoptera: Mymaridae), have been high in southern California, but only on the summer and fall generations of the host. The level of parasitism by other local parasitoids, such as *Gonatocerus morrilli* (Howard) and *Ufens* spp. (Hymenoptera: Trichogrammatidae), has been generally very low. It is clear that parasitoids attacking the spring generation of *H. coagulata* need to be imported, screened through quarantine, reared, registered and released through the appropriate permit process, and monitored, in order to impact this pest. Several field expeditions to locate natural enemies of *H. coagulata* and its close relatives were undertaken, including two trips to the Mexican states of Nuevo León and Tamaulipas in early March and April 2000. Preliminary results of these activities were reported by Morgan et al. (2000); this paper provides taxonomic notes on the parasitoid species discovered through our survey and also indicates their host associations, most of which are new records.

Members of the tribe Proconiini (Homoptera: Cicadellidae: Cicadellinae), to which *Homalodisca* Stål belongs, often are referred to as sharpshooters. Distri-

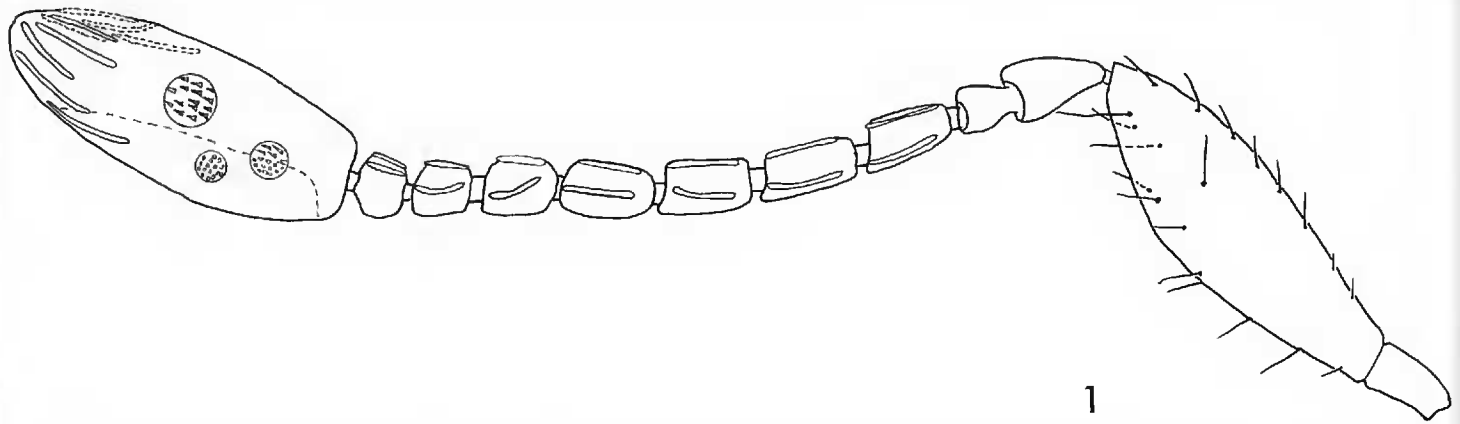


Figure 1. *Gonatocerus atriclavus* Girault. Antenna, female.

bution of the 55 genera and numerous species that comprise this tribe is restricted to the Western Hemisphere (Young 1968); only a few of those occur in the United States, most of them are Neotropical.

In our survey, we searched for egg parasitoids of the species in two sharpshooter genera, *Homalodisca* and *Oncometopia* Stål, based on data obtained during the previous year (Triapitsyn & Phillips 2000). All collections in Mexico were made under a permit issued to our collaborator, E. Ruíz Cancino, Universidad Autónoma de Tamaulipas at Ciudad Victoria. We searched for parasitized sharpshooter egg masses mainly in parks, citrus orchards, and irrigated private gardens. Adult sharpshooters were collected directly in 70% ethanol for further identification and association with the egg masses on their host plants. All parasitized egg masses were sent to the University of California, Riverside (hereafter UCR), quarantine facility under a USDA permit, where emerged parasitoids were screened, identified, and propagated (Morgan et al. 2000).

Investigative responsibilities were divided between authors so that S.V.T. identified mymarid egg parasitoids and worked on taxonomic aspects of this study as well as on conclusive remarks in the "Discussion", L.G.B. coordinated foreign exploration efforts, L.G.B. and S.V.T. collected parasitized egg masses of Proconiini in Mexico, and D.J.W.M. processed and reared the material in quarantine. Terminology for morphological features used in the description is that of Huber (1988); we use the abbreviation F1, F2, etc., to represent the first, second, etc. funicular segments of the females, and the first, second, etc. flagellar segments of the males. Measurements are given in micrometers (μm) as length or, if necessary, as length/width. Abbreviations for depositories of specimens are as follows: CSCA, California State Collection of Arthropods, Sacramento; UATM, Universidad Autónoma de Tamaulipas, Ciudad Victoria, Mexico; UCRC, Entomology Research Museum, University of California, Riverside; USNM, National Museum of Natural History, Washington, D.C.

GONATOCERUS ATRICLAVUS GIRAULT, 1917, NEW STATUS
(Figs. 1–4)

Gonatocerus triguttatus atriclavus Girault, 1917: 19 (as a new variety).

Gonatocerus triguttatus atriclavus Girault; Huber, 1988: 57.

Type Locality.—Mitan, Trinidad.

Types.—Lectotype ♀ on point [USNM], here designated in order to maintain stability of usage of the name, labeled: 1. "Reared from egg-mass of leafhopper";

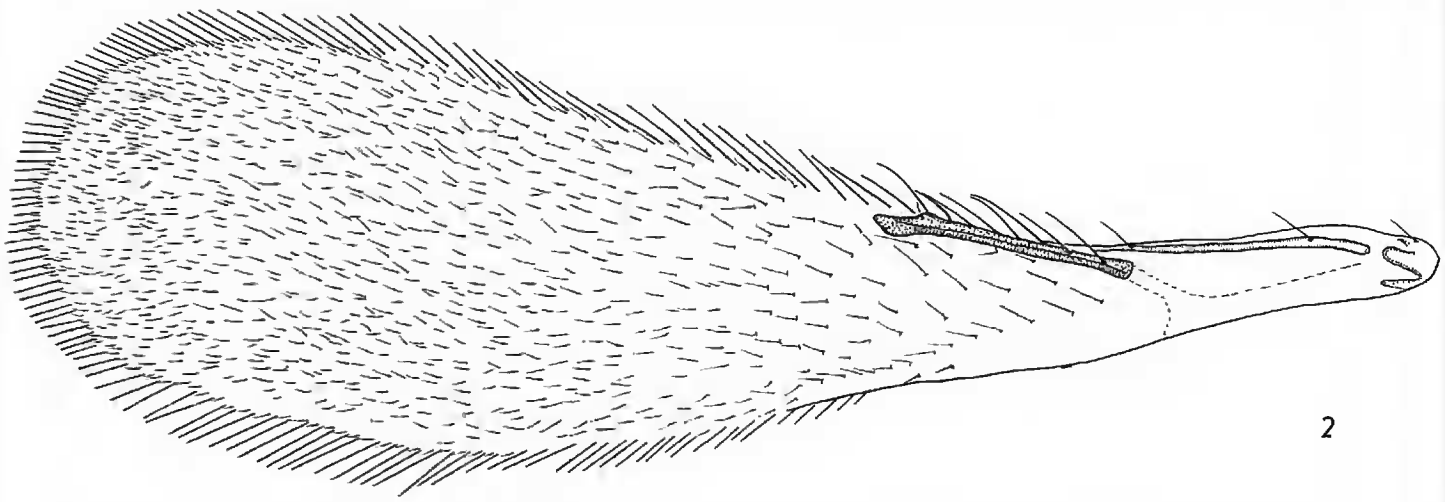


Figure 2. *Gonatocerus atriclavus* Girault. Forewing, female.

2. "Mitan BWI Jan. 1915"; 3. "F. W. Urich Collector"; 4. "53-41"; 5. "*Gonatocerus triguttatus atriclavus* Gir ♂ ♀ types."; 6. "Type No. 20098 U.S.N.M.". Girault (1917) described this species as a variety of *Gonatocerus triguttatus* Girault without designating a holotype, from several "types", Catalogue No. 20098. The type series now consists of the lectotype ♀ mentioned above and 1 ♀ and 1

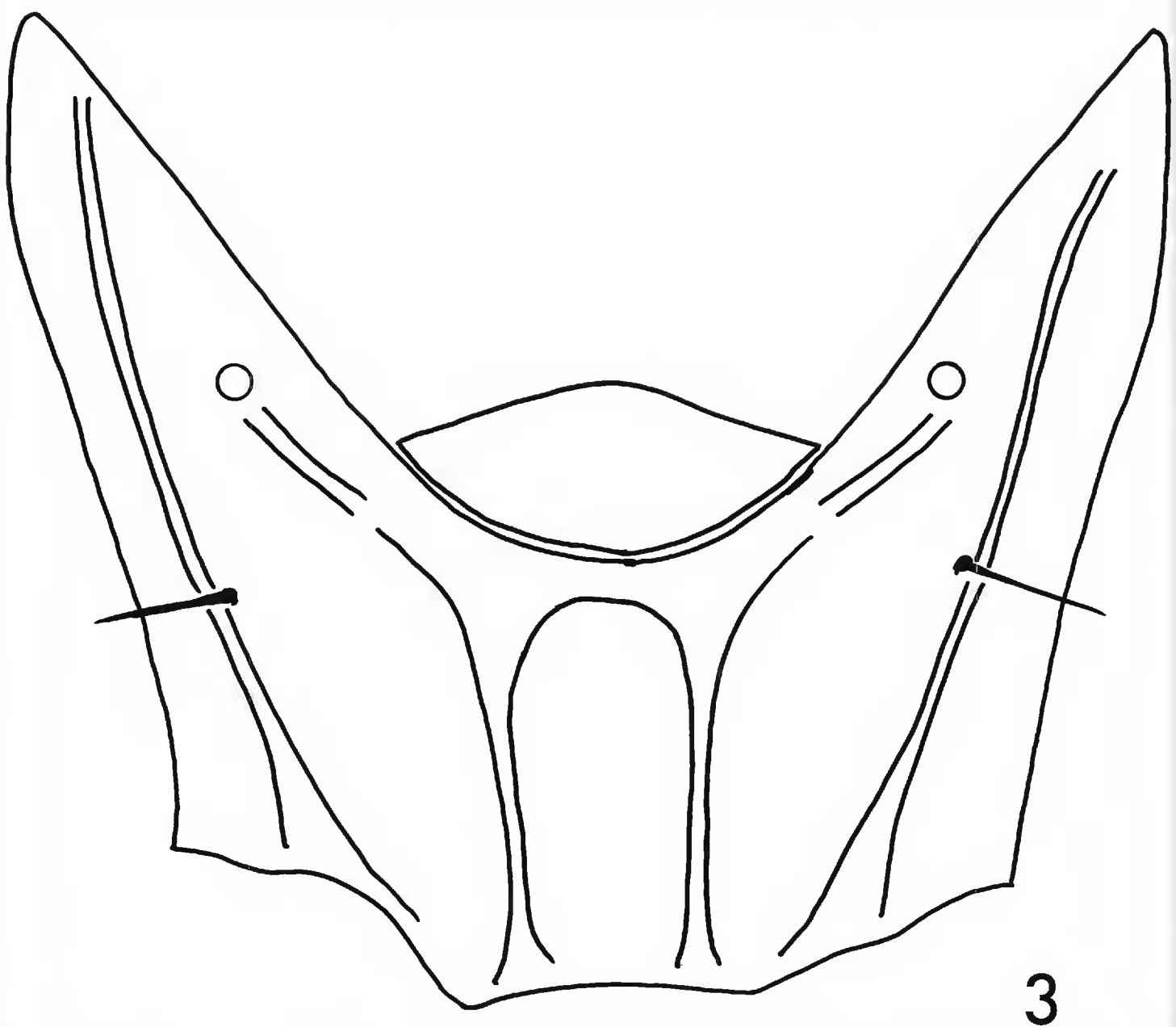


Figure 3. *Gonatocerus atriclavus* Girault. Dorsellum and propodeum, male.

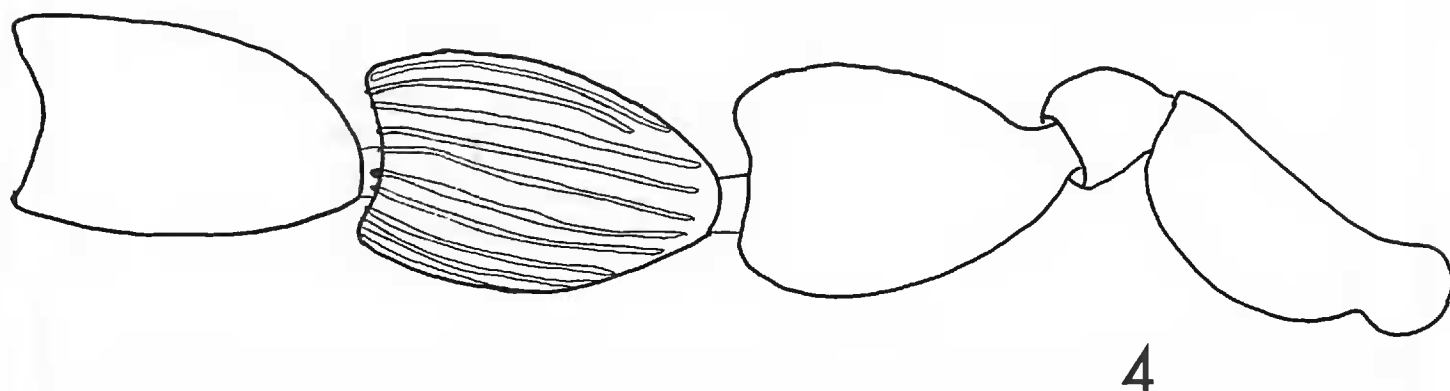


Figure 4. *Gonatocerus atriclavus* Girault. Basal segments of antenna, male.

♂ paralectotypes on points, here designated, labeled same as the lectotype except label 1 is lacking and label 6 with “Paratype” instead of “Type” [USNM].

Other Material Examined.—MEXICO. TAMAULIPAS, Ciudad Victoria, Tamatán, ex. parasitized egg mass of *Oncometopia clarior* (Walker) in hibiscus leaf collected 7 Mar 2000, L. G. Bezark and S. V. Triapitsyn; 2 ♀♀ and 1 ♂ parasitoids emerged at UCR quarantine 20 Mar 2000 [UCRC]. 3 ♀♀ and 1 ♂ labeled: 1. “MEXICO, interc.[epted] S. Antonio, Tex. VI-10-1959 Johnston”; 2. “59-21950 3325 on palm leaves”; 3. “*Gonatocerns triguttatus atriclavus* Girault det. J. T. Huber 1984” [USNM].

Original Description.—The original description is inadequate as it is limited to a single sentence: “Similar to typical form but the antenna concolorous except the club” (Girault 1917). Huber (1988) was first to notice that *G. atriclavus* “is probably a good species, not a subspecies of *triguttatus*”.

Redescription.—*Female.*—*Coloration.* Head pale except upper face and ocellar triangle brown, trabeculae and occiput dark brown, eyes and ocelli dusky. Antenna with scape yellow to light brown; pedicel, F1–F3, F4 (basally) and F7 brown; F4 (distally), F5 and F6 light brown; F8 dark brown; club black. Neck pale, pronotum pale brown with darker spots; mesoscutum orange-brown anteriorly and yellowish posteriorly, parapsidal furrows black; anterior scutellum light brown to brown; axilla brown with darker spot at middle; posterior scutellum yellowish-orange-brown; dorsellum, propodeum, pro-, meso-, and metapleura brown; lateral panels of metanotum and propodeal carinae dark brown. Legs yellowish brown except all tarsi, middle and hind tibiae brown. Wings hyaline; venation brown to dark brown. Petiole dark brown; gaster pale to light yellow with dark brown bands on terga; ovipositor plates brown.

Head: Width 432. Antenna (Fig. 1) with radicle 0.2× as long as scape, scape very long and wide for the species group, 3.0× as long as wide, very finely longitudinally striate (inner side) or almost smooth (outer side), with several rows of strong setae; pedicel short, smooth; F1 short and without sensilla; F2–F5 subequal in length but each slightly wider than preceding article; F6 subquadrate, shorter than F5, F7 slightly wider than long, F8 much wider than long; F2 with 1 or 2 and F3–F8 each with 2 longitudinal sensilla; all funicle segments densely setose; club long (length/width 2.5:1), slightly wider than scape, and about as long as combined length of F1–F4, with 8 longitudinal sensilla, its ventral surface covered with numerous minute, short setae and placoid sensilla, its dorsal surface densely covered with longer setae.

Mesosoma: Pronotum divided medially, each lobe with 1 dorsal and 1 lateral strong seta. Mesoscutum with a pair of strong adnotaular setae. Dorsellum rhomboidal (as in Fig. 3). Propodeal spiracle kidney-shaped; lateral carinae well-developed, submedial carinae almost parallel except anteriorly; propodeum (as in Fig. 3) otherwise smooth. Legs: foretibia with 6–7 conical sensilla. Forewing (Fig. 2) 3.55× as long as wide; marginal cilia very short, longest fringe seta about $\frac{1}{5}$ maximum wing width. Forewing blade bare immediately distal to submarginal vein, with 9 microtrichia behind marginal and stigmal veins, cubital row of setae complete; remainder of blade densely setose. Submarginal vein length 263, with 2 hypochaetae, marginal vein length 216, with 7 microchaetae between proximal and distal macrochaetae, stigmal vein length 58. Hind wing blade bare except for complete rows of microtrichia along margins and several scattered discal setae at apex.

Metasoma: Petiole about as wide as long. Ovipositor about $\frac{3}{4}$ length of gaster, barely exerted beyond its apex. Outer plates of ovipositor each with 1 basal and 1 apical seta.

Measurements ($n = 1$).—*Body:* head: 67; mesosoma: 648; petiole: 72; gaster: 783; ovipositor: 603. *Antenna:* radicle: 66; scape: 329; pedicel: 88; F1: 47; F2: 80; F3: 84; F4: 80; F5: 80; F6: 65; F7: 51;

F8: 43; club: 303. *Forewing*: 1503/423; longest fringe cilia: 88. *Hind wing*: 1107/69; venation: 513; longest fringe cilia: 106. *Legs* (given as coxa, femur, tibia, tarsus): fore: 198, 306, 351, 369; middle: 126, 270, 450, 364; hind: 201, 405, 531, 441.

Male.—*Coloration*: Antenna brown to dark brown except base of scape yellow; face brown; ocellar triangle and occiput dark brown, remainder of vertex and gena light brown; eyes and ocelli pinkish brown. Neck light brown; pronotum, mesoscutum (except light brown edges of lateral lobes), axilla, anterior and posterior scutellum, dorsellum, and propodeum shining brown; mesosomal pleura light brown. All legs light brown except middle tibia and middle and hind tarsi slightly darker, hind tibia brown. Petiole brown, gaster light brown with several dark cross-bands on terga. Otherwise similar to female except for sexually dimorphic characters, as follows: antenna with scape and radicle fused (Fig. 4); basal flagellomeres relatively wide, all flagellomeres with numerous longitudinal sensilla.

Measurements ($n = 1$).—*Total body length* (dry specimen): 1321; *Antenna*: scape + radicle: 153; pedicel: 54; F1: 160; F2: 182; F3: 171; F4: 186; F5: 193; F6: 186; F7: 187; F8: 172; F9: 176; F10: 173; F11: 233. *Forewing*: 1884/532. *Genitalia*: 303.

Diagnosis.—This species is easily distinguished from all other described Nearctic species of the *ater* species group (*ater* subgroup) of *Gonatocerus* that have the forewing with the cubital row of microtrichia complete, extending to base of marginal vein (Huber 1988) (i.e., *G. ashmeadi* Girault, *G. fasciatus* Girault, and *G. triguttatus* Girault) by the transverse F8 in the female antenna. If using the key by Huber (1988), *G. atriclavus* would be separated from *G. fasciatus* by having the forewing hyaline, without fascia, thus keying to couplet 5 together with *G. ashmeadi* and *G. triguttatus*. Besides the shape of F8 mentioned above, *G. atriclavus* can also be easily separated from these two species by the dilated scape, F5 and F6 lighter colored than other funicle segments, and a very long, black club of the female antenna. In both *G. ashmeadi* and *G. triguttatus*, the funicle of the females is uniformly dark brown to black.

Distribution.—Mexico and Trinidad. Although we collected this species in Ciudad Victoria, Tamaulipas, which is near the border between the Nearctic and Neotropical regions, it appears to be a mainly Neotropical species.

Hosts.—The type series was reared from a "leaf-hopper egg mass" in Trinidad (Girault 1917). Our three specimens from Tamaulipas were reared from a sharp-shooter egg mass on a hibiscus plant which was almost certainly laid by *Oncometopia clarior* (Walker).

Upon emergence in quarantine, all the wasps were fed with honey, and the single male was given time to mate with the females. The females were then exposed to freshly laid egg masses of *H. coagulata* in citrus leaves several times; despite the fact that they attempted to parasitize those eggs, we failed to obtain any progeny. Eventually, wasps were killed in 70% ethyl alcohol to serve as voucher specimens.

NOTES ON OTHER EGG PARASITOIDS OF PROCONIINE LEAFHOPPERS IN NORTHEASTERN MEXICO

***Gonatocerus ashmeadi* Girault.** This common North American species was redescribed and illustrated in detail by Huber (1988), who also indicated its known hosts: *Cuerna costalis* (F.), *Homalodisca coagulata*, *H. lacerta* (Fowler), and *Oncometopia orbona* (F.). *Oncometopia clarior* is added here to that list.

Individuals from northeastern Mexico appeared identical to specimens collected in southern California, except for two rearings of darker-colored individuals from Tamaulipas that were not propagated. We attribute such differences in body coloration to intraspecific variability, which is possibly host-induced.

Under quarantine laboratory conditions (22–25° C, 40–50% RH), the Ciudad Victoria population of *G. ashmeadi* successfully parasitized *H. coagulata* eggs laid in a variety of plants including chrysanthemum (*Dendranthema* sp.), crape myrtle (*Lagerstroemia indica* L.), grape (*Vitis vinifera* L.), sweet orange (*Citrus sinensis* (L.) Osbeck), toyon (*Heteromeles arbutifolia* (Aiton) M. Romer), and *Verbascum* sp. Eggs laid by *H. lacerta* in chrysanthemum, crape myrtle, and sweet orange were also accepted for parasitism. Viable offspring emerged from all material tested. Further studies were then conducted on the biology of *G. ashmeadi* as well as of the two other *Gonatocerus* species discussed below; the results will be reported elsewhere.

Material Examined.—*Gonatocerus ashmeadi*: MEXICO: NUEVO LEÓN, Monterrey, UANL campus, ex. parasitized host egg masses coll. 6 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 18 ♀♀, 7 ♂♂ em. 21 Mar 2000 at UCR quarantine (ex. *Oncometopia clarior* (Walker) on leaves of *Fraxinus* sp.). TAMAULIPAS: Ciudad Victoria, 14 Feb 2000, S. N. Myartseva, 16 ♀♀, 2 ♂♂ (ex. sharpshooter eggs on citrus leaf); Ciudad Victoria, Tamatán, ex. parasitized host egg masses coll. 7 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 19 ♀♀, 7 ♂♂ parasitoids em. in UCR quarantine 14–23 Mar 2000 (ex. *Oncometopia clarior* (Walker) on hibiscus leaves); Llera de Canales, ex. parasitized sharpshooter egg mass (on hibiscus leaf) coll. 8 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 1 ♀, 1 ♂ parasitoids em. in UCR quarantine 23 Mar 2000; Municipio Hidalgo, nr. Ejido Benito Juárez, garden in Hotel Hacienda Santa Engracia, ex. parasitized sharpshooter egg mass (on orange leaf) coll. 10 Apr 2000, L. G. Bezark and S. V. Triapitsyn, 7 ♀♀, 3 ♂♂ em. 14 Apr 2000 at UCR quarantine; 5 km N of Valle Hermoso, ex. parasitized host egg masses coll. 13 Apr 2000, L. G. Bezark, 10 ♀♀, 11 ♂♂ em. 20 Apr 2000 at UCR quarantine (ex. *Homalodisca coagulata* (Say) on hibiscus leaves) [UATM, UCRC].

Oncometopia clarior. MEXICO. NUEVO LEÓN: 6 km SE of Allende, Sanatorio Naturista de Canoas, 10 Apr 2000, L. G. Bezark and S. V. Triapitsyn (on citrus); Monterrey, UANL campus, 6 Mar 2000, L. G. Bezark and S. V. Triapitsyn (on crape myrtle). TAMAULIPAS, Ciudad Victoria, Tamatán, 7 Mar 2000, L. G. Bezark and S. V. Triapitsyn (on hibiscus) [CSCA].

***Gonatocerus morrilli* (Howard).** This species is common in southern U.S.A. and Mexico according to Huber (1988). The only previously known host of *G. morrilli*, *H. coagulata*, was first indicated by Turner & Pollard (1959) and later by Triapitsyn et al. (1998). We observed a female of this species ovipositing in a sharpshooter egg mass, probably that of *O. sp. nr. nigricans* (Walker), on a hibiscus plant in the garden of Hotel Rancho Mariposa, near Santander Jiménez in Tamaulipas. Another leafhopper host of *G. morrilli* that we discovered in Tamaulipas is *O. clarior*.

A colony of *G. morrilli*, individuals of which were morphologically similar to those collected in southern California, was established at UCR quarantine using wasps originating from Ciudad Victoria, Tamaulipas. They were successfully reared on both *H. coagulata* and *H. lacerta* eggs laid in host plants as described previously for *G. ashmeadi*.

Material Examined.—MEXICO. TAMAULIPAS: Ciudad Victoria, Tamatán, ex. parasitized host egg mass coll. 7 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 9 ♀♀, 1 ♂ parasitoids em. in UCR quarantine 20–21 Mar 2000 (ex. *Oncometopia clarior* (Walker) on hibiscus leaf); Llera de Canales, ex. parasitized sharpshooter egg masses (on citrus and hibiscus leaves) coll. 8 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 14 ♀♀, 2 ♂♂ parasitoids em. in UCR quarantine 14–23 Mar 2000; same location and collectors, ex. parasitized sharpshooter egg mass (on orange leaf) coll. 11 Apr 2000, 2 ♀♀, 1 ♂ parasitoids em. in UCR quarantine 17 Apr 2000; nr. Santander Jiménez, Hotel Rancho Mariposa, ex. parasitized sharpshooter egg masses (on hibiscus leaves) coll. 9 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 7 ♀♀, 3 ♂♂ parasitoids em. in UCR quarantine 15–20 Mar 2000; same location, 22 Apr

1999, S. Triapitsyn, 2 ♀♀ (on hibiscus, by sweeping); 5 km N of Valle Hermoso, 10 Mar 2000, S. Triapitsyn, 1 ♂ (on hibiscus, by sweeping) [UATM, UCRC].

***Gonatocerus triguttatus* Girault.** This species was redescribed and illustrated by Huber (1988) based on the type series from Trinidad and additional specimens from Texas. Adult specimens of *G. triguttatus* were reared in northern Tamaulipas during April 1999 from the egg masses of its only known host at that time, *H. coagulata*, laid in citrus and peach leaves (Triapitsyn & Phillips 2000). In early spring of 2000, we dissected dead specimens of *G. triguttatus* from an egg mass of a sharpshooter on a citrus (orange) leaf in Gómez Farías, which is in the tropical part of Tamaulipas. These specimens apparently could not emerge from the egg mass and had died not long before we found them. From the same orange tree, we collected an adult male leafhopper, later identified by Raymond J. Gill as *Paraulacizes thunbergi* (Stål); that species thus can be considered as a probable host for *G. triguttatus*. *Paraulacizes thunbergi*, previously known from southern Mexico (Young 1968), is a new addition to the list of proconiine leafhoppers in Tamaulipas that feed and oviposit on citrus plants (Coronado-Blanco et al. 2000). Additional adult specimens of *P. thunbergi* were collected in the Nearctic part of Mexico in Nuevo León and Tamaulipas. Other apparent hosts of *G. triguttatus* are *O. clarior* and *O. sp.* (see "Material examined" below).

A colony of *G. triguttatus* was established at UCR quarantine (Morgan et al. 2000) from adults that emerged from the egg masses of *H. coagulata* in hibiscus near Valle Hermoso, Tamaulipas. This colony was being reared on *H. coagulata* eggs laid in chrysanthemum and orange leaves. All plants tested with *G. ashmeadi* were also accepted by *G. triguttatus*. When *G. triguttatus* females were offered eggs of the smoke-tree sharpshooter, *H. lacerta*, which is native to California, they readily parasitized them and produced viable offspring.

Material Examined.—*Gonatocerus triguttatus*: MEXICO. NUEVO LEÓN, 6 km SE of Allende, Sanatorio Naturista de Canoas, ex. parasitized host egg mass coll. 10 Apr 2000, L. G. Bezark and S. V. Triapitsyn, 1 ♀ em. 14 Apr 2000 in UCR quarantine (ex. *Oncometopia clarior* (Walker) on orange leaf). TAMAULIPAS: Gómez Farías, 8 Mar 2000, S. N. Myartseva, L. G. Bezark and S. V. Triapitsyn, 1 ♀ (dissected from a sharpshooter egg mass on orange leaf); nr. Santander Jiménez, Hotel Rancho Mariposa, ex. parasitized host egg mass coll. 9 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 2 ♀♀ parasitoids em. in UCR quarantine 15 Mar 2000 (ex. *Oncometopia sp.* on hibiscus leaf); 5 km N of Valle Hermoso, 10 Mar 2000, S. Triapitsyn, 1 ♂ (on hibiscus, by sweeping); same location, ex. parasitized host egg masses coll. 13 Apr 2000, L. G. Bezark, 14 ♀♀, 15 ♂♂ em. 20–27 Apr 2000 at UCR quarantine (ex. *Homalodisca coagulata* (Say) on hibiscus leaves) [UATM, UCRC].

Paraulacizes thunbergi.—MEXICO. NUEVO LEÓN, 6 km SE of Allende, Sanatorio Naturista de Canoas, 10 Apr 2000, L. G. Bezark and S. V. Triapitsyn (on *Malva sp.*). TAMAULIPAS: Gómez Farías, 8 Mar 2000, S. N. Myartseva, L. G. Bezark and S. V. Triapitsyn, 1 ♂ (on orange); Municipio Hidalgo, nr. Ejido Benito Juárez, garden in Hotel Hacienda Santa Engracia, 7 Mar 2000, S. N. Myartseva, L. G. Bezark and S. V. Triapitsyn (on *Malva sp.*) [CSCA].

Ufens sp. This species first emerged from a single sharpshooter egg mass laid in an orange leaf collected at Llera de Canales, Tamaulipas. It was later reared in Nuevo León from the eggs of *O. clarior*. It is a gregarious species: 76 wasps emerged from a clutch of 15 sharpshooter eggs (3–7 emergences per host egg). Morphologically, *Ufens sp.* is very similar to, but probably distant from, one taken from unspecified leafhopper eggs on elm and jojoba in southern California; *H. lacerta* is known to be a common associate to the latter plant there. It is also different from the other two *Ufens* species known from *Homalodisca* eggs in

southern California. All species involved are almost certainly undescribed (J. D. Pinto, personal communication).

An attempt was made to initiate a colony of the Mexican *Ufens* sp. at UCR quarantine. In the first generation, wasps were offered egg masses of *H. coagulata* laid in leaves of chrysanthemum (14 egg clutches), toyon (2), grape (2), and orange (6). Wasps emerged from only one clutch, laid in an orange leaf, after 16 days, a longer developmental period than was observed for any of the three *Gonatocerus* species evaluated (D.J.W.M., unpublished data). The second generation was offered host eggs on *Verbascum* sp. (4), crape myrtle (6), orange (17), and chrysanthemum (8). No wasps emerged from these leaves. We suggest that a combination of conditions and strong host plant preferences are responsible for the failure to propagate this trichogrammatid species successfully.

Material Examined.—MEXICO. NUEVO LEÓN, 6 km SE of Allende, Sanatorio Naturista de Canoas, ex. parasitized host egg mass coll. 10 Apr 2000, L. G. Bezark and S. V. Triapitsyn, 37 ♀♀, 6 ♂♂ em. 17 Apr 2000 at UCR quarantine (ex. *Oncometopia clarior* (Walker) on orange leaf). TAMAULIPAS: Llera de Canales, ex. parasitized sharpshooter egg mass collected 8 Mar 2000, L. G. Bezark and S. V. Triapitsyn, 62 ♀♀, 14 ♂♂ parasitoids em. in UCR quarantine 14–15 Mar 2000 [UATM, UCRC].

DISCUSSION

Considering the great diversity of the proconiine leafhoppers, which are among the largest leafhoppers known, and whose eggs are laid in clusters in plant tissue (Young 1968), it is surprising how little is generally known about their biology and natural enemies beyond a few economically important species in the United States. The work by Turner & Pollard (1959) had been practically the only one available on this subject until recently, when the establishment of *H. coagulata* in California prompted the interest in sharpshooter investigations, including studies of their egg parasitoids (Triapitsyn et al. 1998).

Most of the reported egg parasitoids of *Cuerna*, *Homalodisca* and *Oncometopia* species are members of *Gonatocerus*. All known North American species parasitic on these leafhopper genera belong to the *ater* species group of *Gonatocerus* as defined by Huber (1988), and we believe that this might be the case for all proconiines in the New World. The amazing diversity of *ater* group species of *Gonatocerus* in Malaise trap samples from Central and South America correlates very well with the even greater diversity of the sharpshooters from these areas. Further research is needed to demonstrate the validity of this apparent correlation.

It is unlikely that species of the *ater* group of *Gonatocerus* in the New World are species-specific to their leafhopper hosts; rather, they may be narrowly to broadly oligophagous, i.e., able to parasitize species of a number of closely-related host genera within the tribe Proconiini. Some species of parasitoids, however, may display a preference for certain sharpshooter species. Most likely, however, that they discriminate their hosts based on the size of hosts' eggs and the habitat. Some sharpshooter species, like *H. coagulata*, are able to feed upon many plant species, but prefer certain ones for oviposition. To be successful in finding host egg masses, female parasitoids must concentrate their searching activity on those plants. As a result, different parasitoid species may have become more host plant specific than insect host specific, like for instance the common North American mymarid *Anagrus nigriventris* Girault (Al-Wahaibi & Walker 2000). Thus, for a classical biological control program to be successful in California against *H. coa-*

gulata, whose females oviposit on a great number of different plants, introduction of many different species, as well as various biotypes from any given species, may be warranted.

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